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ABSTRACT

A study of the institutional factors at research universities that motivate faculty to pursue research grants and are correlated with significant movement up and down an index of overall research activity is reported. Two institutions within one state system, one with a positive and one with a negative change, are used. Surveys of faculty at research and other universities report teaching, not research, is the main interest of faculty. Most faculty at research universities see publication as a primary source of professional achievement and as the main requirement for promotion, tenure, and higher salaries. Yet, they suggest, mere reinforcement for research and publication is not enough. This discordance between the acknowledged rewards and faculty efforts suggest the present system, based on motivational incentive of extrinsic rewards, may not be working well. The use of an intrinsic motivation and self-determination framework will allow the evaluation of the intrinsic or extrinsic nature of a reward and provide a basis for comparing the merits of a human resource framework versus a rational management framework. Research topics addressed are: (1) the relationship between intrinsic and extrinsic motivation and the Research Activity Index (RAI) rank; (2) the perceptions of faculty at institutions with increasing or decreasing RAI rank regarding motivators or amotivators for the submission of proposals and management of research grants; (3) how faculty perceptions compare with the research administrators' perceptions of motivational factors; and (4) whether faculty at universities with consistently high RAI ranks encounter motivators in place that encourage them to submit more proposals and/or acquire more grants than faculty in universities without high RAI ranks. Contains 65 references. (SM)

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Institutional Factors that Motivate Research Activity In Research Universities

A Progress Report

By

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presented at

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Faculty at Work: Teaching, Research, and Service

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Institutional Factors that Motivate Research Activity In Research Universities

A Progress Report

This is a report of research in progress to study the institutional factors, at research universities, that motivate faculty to pursue research grants and are correlated with significant movement up and down an index of overall research activity. The analysis will assess the viability of a rational management versus a human resource framework for stimulating such activities. In particular the relative influence of extrinsic and intrinsic motivational factors will be considered.

Background

Research has been part of the higher education mission since the latter part of the nineteenth century (Geiger, 1986). Since 1940, however, research has expanded from an activity to prepare graduate students for professional roles to an independent role of producing knowledge for government and independent sources (Ben-David, 1977). The number of Research I universities, as defined by the Carnegie classification scheme, has increased 47 percent between 1976 and 1985 (Chronicle of Higher Education, 1987). Institutionally, research has become an important source of income. Nationally, higher education institutions receive approximately 13 percent of their revenues from grants and contracts (Brinkman and Leslie, 1985). In 1985-86, for example, Arizona State University (ASU) received 13.5 percent of it's current fund revenues from grants and contracts (ASU Fact Book, 1986). The University of Arizona (UA), more active in research, received more than 33 percent of it's revenues from research grants and contracts in 1983-84 (estimated from UA Fact Book, 1984). ASU and UA were nationally ranked 63rd and 25th respectively in research activity (Leslie and Brown, 1988).

University research is a vital national resource. Of the total research and development budget of the United States for 1970 ($3,935,000,000), 53 percent ($2,050,000,000) was spent by colleges and universities (Gluck and Thorp, 1974). In 1983-84, the research expenditures of colleges and universities were $6,723,000,000 (Chronicle of Higher Education, 1986). In 1986, universities performed 56 percent of basic and 15 percent of applied research (Chemical and Engineering News, 1986). Research not only provides a continually expanding knowledge base for both science and technology, it is also a source of expertise for government and industry. Moreover, scientific and technical advances have been linked to economic development and vitality in the United States (Muffo, 1986). Publicly funded research and development by universities is an integral part of the physical and social infrastructure for private profit making in the United States (Slaughter and Silva, 1985). Universities, for example, have been responsible for the development of the biotechnology industry (Kenney, 1986). They have helped spawn and support the growth of new high technology industries, a role reflected partly

in the many patents held by universities. University based research has helped make the university an "axial institution" in modern society (Perkin, 1984).

Although the importance of university research is accepted, little has been done to identify institutional factors that stimulate research activity. Many studies have identified either individual faculty characteristics that can be correlated with high research productivity or the institutions where productive individuals work. The proposed study shifts the unit of analysis to the organizational level: by looking both at organizationally grounded motivational factors and at the research activity of institutions, rather than of individuals. Two problems are addressed: first, whether there are institutionally grounded motivational factors that may explain why some institutions greatly increase research activity, while others plateau or decline; and second, what factors may motivate faculty to prepare and submit research proposals.

An institution's research effort typically is measured in terms of research and development (R&D) expenditures. This measure weighs heavily the conduct of expensive research, e.g., research that requires expensive equipment, laboratories and technology, such as certain medical projects, high energy physics, and oceanographic exploration. In an effort to measure institutional research activity on a broader base, Ashton and Leslie (1986) developed a Research Activity Index (RAI). The RAI was expanded and refined by Leslie and Brown (1987) for rating the research activity of the top 200 research universities and colleges in the United States. The RAI has been calculated for the years 1980 and 1985. Fourteen variables were used in the calculation, including research and development expenditures, full time faculty employed, library rating, number of Ph.D.'s awarded, and number of doctoral research personnel employed. The calculation yields a RAI score that reflects the relative scale of research activity.

The Problem

Surveys of faculty at research universities and universities in general have reported that teaching, not research, is their primary interest of faculty (Lazarsfeld and Thielens, 1958; Fox, 1985; Finkelstein, 1984). Finkelstein (1984) found a three to one majority of American professors who have consistently reported their interests as focusing more on teaching than on research. More than half the faculty spend less than four hours per week engaged in research. Although four-fifths of faculty in one study viewed research as having the supreme influence on the distribution of organizational rewards and only 20 percent believed that teaching activities would pay off, faculty, nevertheless, reported spending most of their time on teaching-related activities (Finkelstein, 1984). Faculty who publish little or not at all predominate at most higher education institutions (Jalongo, 1985).

The above authors were describing faculty in general. However, faculty at the research universities are not terribly different (McKeachie, 1979). The interests of 50 percent of

faculty at "high quality" universities are either leaning to or are heavily into teaching and 51 percent have few current publications. Ladd (1979) found that 40 percent of faculty at research universities spend less than nine hours per week on research and 72 percent have not published in the last two years. Interest in research and publications is lower at universities not rated "high quality" (Fulton and Trow, 1974).

Most faculty at research universities regard publication as a primary source of professional achievement and pride and as the main requirement for promotion, tenure and higher salaries (Jalongo, 1985; Fox, 1985; Finkelstein, 1984). Yet, faculty suggest that mere reinforcement, in the form of promotion and tenure, for research and publication is insufficient (Jalongo, 1985; Fox, 1985). This discordance between the acknowledged rewards and faculty efforts suggest that the present system, based on the motivational incentive of extrinsic rewards may not be working particularly well.

Framework

The existing system of promotion and tenure is based on a rational management framework offering extrinsic rewards to achieve institutional goals (McKeachie, 1979; Becker, 1979). Other rationally grounded rewards and incentive systems encouraging research performance include load reductions, increases in support staff and travel monies (Jalongo, 1985). The use of these extrinsic rewards in incentive programs has been described by Z. Bowen (1985). The rational management model assumes that monetary incentives are sufficient to cause faculty to choose some activities over others (Tuckman, 1979). Although faculty are pursuing self-determined goals, they are believed to be optimizing internal goals subject to external monetary rewards in response to externally determined criteria (Becker, 1979). The institution establishes the goals and the external criteria to reward. And the faculty, rationally calculating and responding to those external motivators, act accordingly. The focus on fitting roles, organizational structures, and external rewards to organizational goals is typical of a rational management framework (Bolman and Deal, 1987).

Incentives in rational frameworks can take a variety of forms, tangible and intangible, direct and indirect (Z. Bowen, 1985). Merit pay, grants, and technical assistance are direct tangible incentives. Resources such as facilities, libraries, equipment and faculty clubs are tangible indirect incentives. Examples of intangible direct incentives include, tenure, promotion, sabbaticals, release time, and recognition. Faculty forums and visiting professorships are classified as intangible indirect incentives. Z. Bowen (1985) suggests that incentives be built on the personal wants of the faculty and that they be tied to defined goals, also typical of a rational management framework. This grouping is one way of classification and was chosen to illustrate the variety of incentives that are possible.

The limitations of a framework that is limited to the rational can be illustrated by comparing the projections made by Tuckman to the results of recent studies. Tuckman writes:

> Perhaps the most distressing aspect of our inquiry is the observation that the reward structure primarily favors performance when faculty have a large number of years left to work. In the absence of a change in the existing reward structure, it seems likely that as faculty members age, their incentive to remain productive will diminish. Given the expected aging of our nation's faculty members, this implies a reduction in the overall productivity at American universities. It is difficult to interpret what this will mean for the intellectual development of our nation; it is almost certain to have an impact on the lives of individual faculty. (Tuckman, 1979, pp 187 & 188)

Recent studies, on the other hand, conclude that productive faculty are productive through-out their careers (Finkelstein, 1984; Fox, 1985).

Research indicates that while the extrinsic rewards of promotion and tenure may be necessary, they are not sufficient to motivate faculty to pursue research and research grants (Jalongo, 1985; Finkelstein, 1984; Fox, 1985; McKeachie, 1979). The financial reward system, for example, needs to be comparable to similar positions at other universities or in the industrial sector (Fox, 1985; Z. Bowen, 1985; Baldwin and Krotseng, 1985; Peltz and Andrews, 1976) The above observations and the importance of individual perception of rewards (McKeachie, 1979) suggest that a human resource framework may be more applicable for the research university. A human resource management framework is one in which the emphasis is on the interdependence between people and the organization (Bolman and Deal, 1987). The management emphasis in a human resource framework is on fitting the needs, skills and values of individuals with formal roles and relationships in order to achieve the collective goals and purposes of the organization.

In discussing the motivators of academic behavior McKeachie (1979) suggests that faculty are more responsive to intrinsic than extrinsic rewards and that the faculty perception of the reward value is the controlling factor. Extrinsic rewards are confounded by short term exigencies such as extra classes, committee work, student advising, etc. (Austin and Gamson, 1983). The value of intrinsic rewards has been stated by other students of higher education faculty (Bowen and Schuster, 1986; Fox, 1985; Finkelstein, 1984). The conditions that maximize intrinsic motivation, autonomy, participation in management and affirmation of competence (Deci and Ryan, 1985) are present in higher education institutions (Bowen and Schuster, 1986). For example, in higher education institutions faculty autonomy and faculty participation in management through senates and departmental committees have been posed as the preferred conditions, and the ones found most often in research universities (Mortimer and McConnel, 1978). Moreover, faculty

look to their professional peers for affirmation of their competence (Deci and Ryan, 1982). The use of an intrinsic motivation and self determination framework (Deci and Ryan, 1985) will allow the evaluation of the intrinsic or extrinsic nature of a reward and provide a basis for comparing the merits of a human resource framework versus a rational management framework. An understanding of the factors that motivate faculty to engage in research and publication will be of value to administrators for incorporation into policy and procedure.

Intrinsic motivation (Deci and Ryan, 1985) is based on people's innate, organismic needs for competence and self-determination. It energizes a wide variety of behaviors for which the rewards are experiences of autonomy and effectualness. Motivation is being fueled by the need for competence and self-determination, through seeking and attempting to conquer optimal challenges. A challenge requires stretching one's abilities. This organismic motivation theory is based on the following assumptions. First, human beings act on their internal and external environments to satisfy the full range of their needs. They actively attempt to master the forces in their environment and the forces of drives and emotions in themselves. These actions yield an internal unified structure called self. Second, the life force or energy for the activity and for the internal development is what is referred to as intrinsic motivation. Intrinsic motivation can be treated as a primary central nervous system need that does not have an appreciable effect on non-nervous system tissues. Third, the need for competence leads people to seek and conquer challenges that are optimal for their capabilities, and competence acquisition results from interaction with stimuli that are challenging.

Research Questions

The following research questions, in order of priority, will be addressed.

1) What is the relationship between intrinsic and extrinsic motivation and the RAI rank?

2) What do those faculty at institutions with increasing or decreasing RAI rank perceive as motivators or amotivators for the submission of proposals and management of research grants?

3) How do faculty perceptions compare with the research administrators' perceptions of motivational factors? Research administrators are those with institutional roles in grant administration and policy, such as grant and contract managers, deans and vice presidents or vice chancellors for research.

4) Do the faculty at universities with consistently high RAI ranks encounter motivators in place that encourage them to submit more proposals and/or acquire more grants than faculty in universities without them?

Methodology

The dependent variables of this study will be the RAI rank change and grant/proposal activity change, both measures of increasing or decreasing research activity. These will be treated separately as categorical variables, being positive or

negative. During the period 1980-85, some universities greatly increased their RAI rank while other institutions significantly lowered their RAI rank (Leslie and Brown, 1987). Forty institutions changed RAI rank by more than seven places: fifteen of these changed positively and twenty-five changed negatively.

Two institutions within one state system, one with a positive change and one with a negative change, have been identified. In 1980, these two institutions had RAI ranks of 79 and 83 respectivily; in 1985, the RAI rank had changed to 66 and 91, respectively. Both institutions had a positive research and development expenditure rank change of 8 and 1, respectively. These two institutions will be visited and the following types of data will be gathered as the independent variables.

The perceptions of faculty and research administrators will be gathered through interviews. Their perceptions along with grant proposal and research activity will be used to assess the extrinsic and intrinsic nature of motivational factors. It is anticipated that extrinsic factors may be either motivational or amotivational. The perceptions of research administrators will be compared to those of faculty. Documents, such as policy and procedure manuals, annual reports and grant preparation handbooks, will be collected to provide detailed data on grant procedures and activities. Values for institutional motivating factors will be obtained from the faculty and research administrators to compare their perceptions of locus of control, interest, excitement, source of research initiatives, and control of grant monies received. Both external locus of control or external control of grant monies are amotivational, whereas moving those controls to the researcher and/or eliminating the "red tape" are common extrinsic motivational techniques. Faculty perception of support for their research proposals would be intrinsicaly motivating, whereas having their proposals channelled into institutional research emphasis areas would be extrinsicaly motivating and may be either positive or negative. High interest and excitement are obvious indicators of intrinsic motivation. Faculty perceiving they possess locus of control, control of grant monies and of being the source of research initiative are also important intrinsic motivators (Deci, 1988). The faculty perception of the significance of receiving a research grant will be obtained. If it is informational (telling them that they are proficient) it is intrinsically motivating. If it is controlling (that this is to drive them in a particular direction) it is amotivating. Finally, the Carnegie Faculty Survey of 1984 will be analyzed to evaluate the fit of the intrinsic motivation model (Deci and Ryan, 1985) to research university faculty and to compare the sample of this study with research university faculty in general.

Results

Institutional profiles

Two institutions within one state system are used in this case study. These institutions are both Carnegie Classification,

Research II. The institutions chosen are in the same state system, thus keeping the budget figures comparable. The budget systems are not identical but the state reporting requirements force the institutions to prepare state reports that are comparable. Both of these institutions are moderatly sized with limited resources. Each of these institutions has a major area of research, one being medicine and the other agriculture. The contribution of the major reseach area to each is approximatly 47%. The distribution of the remainder of the research funds across the academic departments is similar.

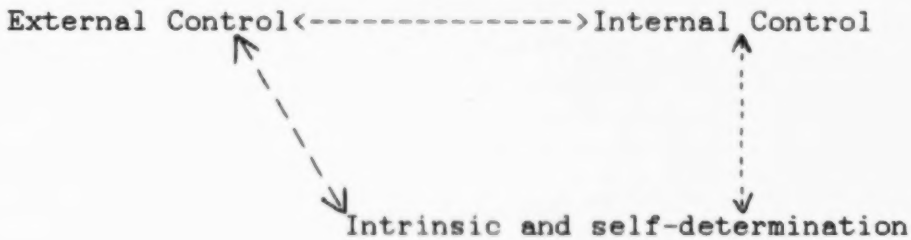
Selection Criteria for Sample Institutions

Institution Variable	I	II
RAI Rank 1980	79	83
RAI Rank 1985	66	91
Change in RAI Rank	13	-8
R & D Expenditure Rank 1980	82	76
R & D Expenditure Rank 1985	74	75
Change in Expenditure Rank	8	1
R & D Expenditures 1980 in Millions	$23303	$24961
R & D Expenditures 1985 in Millions	$44458	$44233
Percent Change, Expenditures R & D Expenditures in 1980 dollars	191%	177%

Inferences fron interviews with research administrators.

Research administrators at both institutions were interviewed to determine the administrator's concepts of what the institution was doing to promote the submission of grant proposals and to ascertain the purposes of the specific programs and procedures of proposal submission. A schematic framework for the evaluation of the research administrators responses follows.

Intrinsic motivation - self-determination can be schematically represented as:



When looking at policies and procedures one can consider them to be either regulating or facilitating yielding the schematic:

Regulate <----------> Facilitate

By facilitating and assisting the researchers and giving them the freedom to pursue knowledge the institution allows either internal control or intrinsic motivation to stimulate the researcher. Policies, procedures activities that give the researcher self-affirmation would be evaluated using the first schematic.

It is my impression, as a result of these interviews, that Institution I is overtly active in pursuing grants and is intent on climbing the rating ladder of research institutions. They are working at simplifying the proposal process, the management of the grants received, stimulating new faculty and expanding the research plant. In contrast, Institution II is quite blasé about the research activity. They explicitly stated that they are not "proactive" in encouraging faculty to pursue research grants; it was upn to the faculty to seek funding for their research. Below is a list of selected questions and institutional responses in support of the impression stated above.

How do you perceive the role of this office?

Response from Institution I.
Primary is role to be the delegated authority to solicit and accept extramural funds.

Response from Institution II.
This office accepts and submits proposals for the instutition. The office's role is to oversee the proposals and to ensure that they fall within t[illegible]idelines and legal requirements of the institution, [illegible]subjects regulations, etc.

What is the relationship with the faculty?

Response from Institution I
.....assisting faculty in processing and managing the grants. To assist faculty with the identification of sources, maintain a data base of faculty interests and skills and notifies the faculty when awards are about to become available, and do this though a newsletter.

Response from institution II
It is the responsibility of the investigator to generate proposals, guidelines are available in the office, file of interests and proposals are maintained. Notices of RFP's are given to appropriate faculty, then it is left up to the faculty. SPIN, Sponsored Project Information Network. We are formally active not "proactive" and do not encourage or push investigators. If they come to our office we will provide them with the guidelines and help with the interpretation of those guidelines, then it becomes the investigator's responsibility.

{SPIN is utilized by both institutions.}

When does the office get involved when a faculty member prepares a research proposal?

Response from Institution I.
This office gets involved when the final draft is submited. Our function is to insure that; budgets are sufficient, the proposal is consistent with formats for the funding agency, the proposal is in complience with instututional guidelines, missions and capabilities

Response from institution II
... it was covered above under institutional role.

What types of internal programs exist to support grant managment and grant application?

Response from Institution I.
This institution provides each faculty member and anyone else who requests a grant management manual claimed to be "one of the best around". The manual is in a three ring binder and easily updated. It contains specifics on how to prepare, submit and manage grants along with a list of who to go to for various types of assistance. No other specific programs, except occasional workshops with adminstrators, to clarify the proposal process.

Response from institution II
Business management, purchasing accounting etc, is provided through normal channels, the bussiness and facilities offices, capital inventories. This institution does keep a central file of records on grants operations

How big is the support staff?

Response from Institution I.
There are nine FTE and that is under staff by at least four. (This institution also has a grants coordinator assigned to each major division. That position is designated in their organizational charts and staffed. A Director of Grants Development was being recruited and would have a separate staff.)

Response from institution II
Manager, pricipal analyst, one analyst, one assistant analyst, one C&G assistant, one analyst for human subjects. (This institution relied on deans and department heads to assist in grant management. The grants manual at this institution was 12 or 15 years old and not readily available to researchers, it was dusty and stored in a far corner of the shelf. It was maintained that the system manual was sufficient.

Comments from this investigator
Institution I has active programs in finding sources to fund the construction of new facitities and young faculty, developing cooperative research programs with industry and expanding the

physical plant. Institution II appeared passive and left the pursuit of funds up to the individual researcher.

When asked about the role of research in the university Institution II's response was that research is part of the three-part mission of the university and that research is just normally part of the faculty's role. Institution II stated that they were not "proactive" in pursueing intact programs. Institution I's response was that they are going to become one of the top research institutions in the system and region. Institution I activily pursues intact research programs that were within the interests of their departments.

Comparisons of the Carnegie Faculty Survey of 1984.

Selected questions from the Carnegie Faculty Survey of 1984 were used to evaluate the fit of an intrinsic motivation model to research university faculty. The Carnegie Faculty Survey includes questions on the interests of faculty and administration (autocratic-democratic) of universities and the extent of the involvement of faculty in these institutions. Analysis of the faculty responses to these questions do not conclusively support the model nor do the data cause one to reject the model.

Several questions deal with interests of faculty (9 and 29-8, 29-11). Intrinsic motivation requires that one finds interest and excitement in what one is doing. When asked if their interests lie primarily in teaching or research 78% (37% responding) of faculty at research I & II universities "lean towards" research. A very low response to the question makes interpretation difficult or impossible. A good response rate (63%) was found on the questions dealing with new developments in their field. The responses to "Exciting developments are taking place in my field" are 65% and 56% agree in Research I and II universities respectively. The response to "new developments in my field are not very interesting to me" were 66% and 60% agree respectively. One cannot determine weither this is a real result or a result of the negative question form.

Other questions analyzed from the Carnegie Faculty Survey have the same types of problems. The significant questions usually have low response rates or conflicting results.

Demographic data supplied by the Carnegie faculty survey will be used to compare the faculty interviewed in this study with a national sample. The data include standard items such as age and rank plus professional activity measures such as puplication rate and professional society activity. The demographic data comparing interviewed faculty with a general faculty sample is incomplete at this time and will not presented here.

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